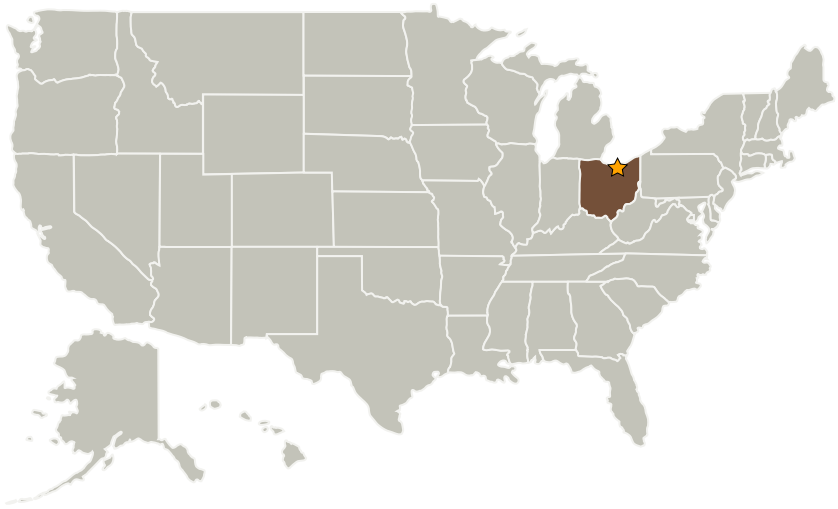
Fiber Optic Sensor System for Cryogenic Fuel Measurement, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

This SBIR Phase I project will address the feasibility of using a fiber Bragg grating array as a means of detecting liquid and slush hydrogen in gravity and zero gravity environments. Fiber optic Bragg grating sensors offer the advantages of a single fiber feed through into the cryogenic vessel for reliability and the ability to multiplex many sensors on a fiber in order to locate a liquid level or a floating mass. The detected parameter will be the differences in the thermal properties of the three hydrogen phases. Methods will be developed to extend the sensitivity of the Bragg grating sensors to at least ten Kelvins. In Phase I, the signal processing for each sensor in a short array will be performed using a robust tunable laser and a curve-fitting algorithm. The feasibility of the method will be demonstrated by using a four-sensor array to detect levels of liquid nitrogen and a single point sensor calibrated to 10K to demonstrate low temperature sensitivity. In Phase II, an array of 50 sensors will be demonstrated and advanced signal processing will be developed. The ability of the tunable laser to withstand launch stresses will be tested.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Lake Shore Cryotronics, Inc.	Supporting Organization	Industry	Westerville, Ohio

Primary U.S. Work Locations
Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Philip R Swinehart

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.5 Electromagnetic Wave Based Sensors